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(71) Applicant: **NSK LTD**

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(54) **LINEAR MOTOR**

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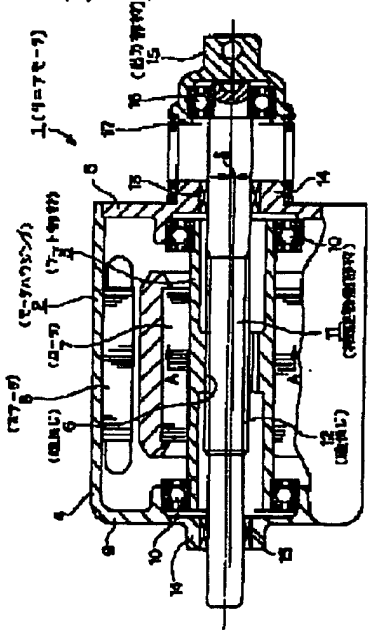

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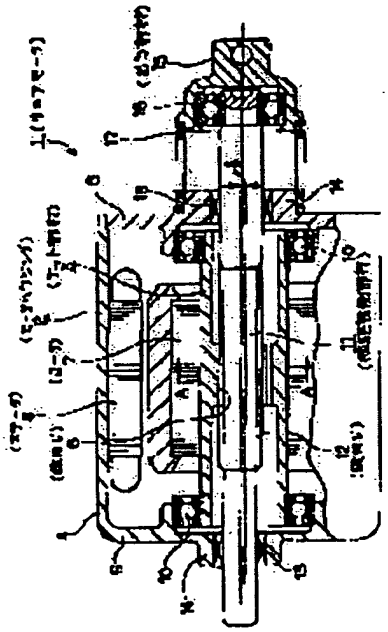

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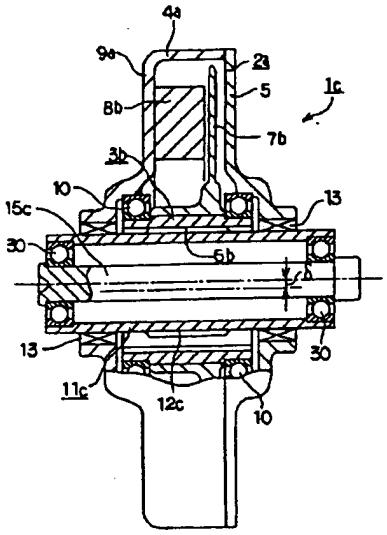

arrange **-like mechanical-component-ed material in parallel to the above-mentioned nut member, and mesh mutually a part of circumferencial direction of the above-mentioned female screw, and a part of circumferencial direction of the above-mentioned male screw
** To the inner skin of the above-mentioned drive flank material, arrange the above-mentioned driving-side member and the above-mentioned driving-side-ed member of each other in parallel, and each meshes mutually a part of circumferencial direction of the above-mentioned protruding line and the part which is the circumferencial direction of the above-mentioned male screw prepared in the circumferencial direction, while the male screw of each other is formed in the periphery side of the above-mentioned driving-side-ed member for two or more parallel protruding lines, respectively.
** While the female screw of each other is formed in the inner skin of the above-mentioned driving-side member for two or more parallel protruding lines, respectively, arrange the above-mentioned driving-side-ed member and the above-mentioned driving-side member of each other in parallel, and mesh mutually a part of circumferencial direction of the above-mentioned protruding line and the part which is the circumferencial direction of the above-mentioned female screw for which each was prepared in the periphery side of the above-mentioned driven flank material at the circumferencial direction.
[0005]
[Function] the variation rate of it is carried out to shaft orientations by rotating a driving-side member based on energization, the linear motor of this invention constituted as mentioned above rotating a driving-side-ed member -- making -- an output member -- the shaft orientations of this driving-side-ed member -- a variation rate is taken out That is, based on energization, the driving-side member which fixed Rota to the periphery side rotates, and the above-mentioned driving-side-ed member rotates in connection with rotation of this driving-side member based on engagement into a thread groove and an engagement slot. In this case, the peripheral speed of these thread grooves and the peripheral speed of an engagement slot become equal mutually. Moreover, the pitch of the thread groove which gears mutually, and the pitch of an engagement slot are mutually equal. On the other hand, since it differs from the pitch diameter of these thread grooves, and the pitch diameter of an engagement slot, while the above-mentioned driving-side member rotates one time, the one or more revolutions of the above-mentioned driving-side-ed members are rotated. Consequently, the output member to which the driving-side-ed member combined with this driving-side-ed member and this driving-side-ed member only the part which rotates too much than a driving-side member carries out a variation rate to shaft orientations.
[0006]
[Embodiments of the Invention] Drawings 1 -3 show the 1st example of the gestalt of the operation of this invention corresponding to the above-mentioned **. Only rotation is supporting the nut member 3 of the shape of a cylinder whose linear motor 1 of this example is a driving-side member at the inside of the motor housing 2 free. That is, the above-mentioned motor housing 2 is constituted in midair by plugging up opening of the closed-end cylinder-like housing mainframe 4 with the disc-like lid 5. Moreover, the bore of the shaft-orientations pars intermedia of the above-mentioned nut member 3 is made smaller than the bore of fractions other than this pars intermedia, and forms in this pars intermedia the female screw 6 whose pitch diameter is D0. Moreover, outside attachment fixation of Rota 7 is carried out in the pars-intermedia periphery side of the above-mentioned nut member 3. On the other hand, a stator 8 is fixed to the inner skin of the above-mentioned motor housing 2, and contiguity opposite of the inner skin of this stator 8 and the periphery side of above-mentioned Rota 7 is carried out. In addition, in this example, the AC motor is used as a motor for a drive. However, especially the structure of this motor itself does not limit, and since it is not the main point of this invention, either, a detailed explanation is omitted.
[0007] The above-mentioned nut member 3 is supporting only rotation free in the inside core of the above-mentioned motor housing 2 by the deep groove type formed between the both-ends periphery side of this nut member 3, and the internal surface of parietal bone of the bottom-plate section 9 which constitutes the above-mentioned housing mainframe 4 and the internal surface of

male screw 12 become equal mutually. Moreover, as shown in drawing 3 , pitch P of the above-mentioned female screw 6 and pitch P of a male screw 12 which gear mutually are mutually equal. On the other hand, pitch diameter D0 of these female screws 6 Pitch diameter d0 of a male screw 12 It differs mutually (D0 > d0). While the above-mentioned nut member 3 rotates one time for this reason, one or more (D0 / d0 time) revolutions rotation of the above-mentioned driving-side-ed member 11 is carried out.

[0012] consequently, part {which this driving-side-ed member 11 rotates too much than the above-mentioned nut member 3 -- the above-mentioned output member 15 which combined only - 1 batch} with the above-mentioned driving-side-ed member 11 and this driving-side-ed member 11 whenever the nut member 3 rotated one time (D0 / d0) -- shaft orientations -- [-- P and {(D0 / d0)-1} part] -- a variation rate is carried out The member which carried out the variation rate to shaft orientations, without this output member 15 rotating the output member 15 to this driving-side-ed member 11 since it can rotate freely although the variation rate of this driving-side-ed member 11 was carried out to shaft orientations, rotating, and combined the point of this output member 15 is pushed, lengthened and carried out. Near and the sliding contact status of the engagement status of the above-mentioned female screw 6 and the male screw 12 are few to the rolling contact. For this reason, power losses in the engagement section of these female screws 6 and the male screw 12 are few, and can acquire high luminous efficacy as linear motor 1 whole.

[0013] Next, drawing 4 shows the 2nd example of the gestalt of the operation of this invention corresponding to the above-mentioned ** too. a book -- an example -- a linear motor -- one -- a -- a case -- **** -- -ed -- a driving side -- a member -- 11 -- a -- a point (right end section of drawing 4) -- a cylinder -- ** -- an output -- a member -- 15 -- a -- a deep groove -- type -- a ball bearing -- 16 -- the above -- -ed -- a driving side -- a member -- 11 -- a -- receiving -- rotation -- and -- this -- -ed -- a driving side -- a member -- 11 -- a -- The elastic bellows 18 is formed between the lateral surface of a lid 5 and the base edges (left end section of drawing 4) of the above-mentioned output member 15a which constitute the motor housing 2. A pre-load means like the 1st example mentioned above is not established. Moreover, the end section (right end section of drawing 4) of the joint cylinder 19 for combining the above-mentioned motor housing 2 with other fractions is combined with the center section of the lateral surface (left lateral of drawing 4) of the bottom-plate section 9 of the housing mainframe 4 which constitutes the above-mentioned motor housing 2. Joint pivotable support is carried out at the fraction which should expand and contract a spacing mutually for the other end of this joint cylinder 19, and the point (right end section of drawing 4) of the above-mentioned output member 15a at the time of use of the structure of this example. Moreover, thrust loading of the orientation which approaches mutually is applied to the above-mentioned joint cylinder 19 and output member 15a by the busy condition.

[0014] Furthermore, that a stroke should be carried out greatly (for a long time) in this example, as the above-mentioned mechanical-component-ed material 11a, a long picture thing is used and male screw 12a is formed in an overall length almost covering the periphery side of this mechanical-component-ed material 11a. and -- being such -- -ed -- a driving side -- a member -- 11 -- a -- the above -- a motor -- housing -- two -- both ends -- respectively -- a deep groove -- type -- a ball bearing -- 20 -- 20 -- rotation -- and -- shaft orientations -- continuing -- displacement -- free -- supporting -- **** . That is, while the outer rings of spiral wound gasket 21 and 21 which constitute each [these] ball bearings 20 and 20 are fixed to the bottom-plate section of the housing mainframe 4 which constitutes the above-mentioned motor housing 2, and the core of a lid 5 by eye a press fit or adhesion, the inner rings of spiral wound gasket 22 and 22 which constitute each above-mentioned ball bearings 20 and 20 are attached outside the above-mentioned driving-side-ed member 11a by the running fit. In addition, it is desirable to consider as the square thread which in the case of the structure of this example contains the trapezoidal thread when the friction status with the inner skin of each above-mentioned inner rings of spiral wound gasket 22 and 22 is taken into consideration, although the cheap triangular crest screw thread was sufficient as the manipulation cost as male screw 12a formed in the periphery side of this driving-side-ed member 11a. Since other configurations and operations are the same as that of the case of the 1st example mentioned above, the same sign is given to an equivalent fraction and

are supported inside [flat] motor housing 2a. That is, only rotation is supporting the above-mentioned nut member 3b free to the shaft-orientations pars intermedia of this motor housing 2a by the ball bearings 10 and 10 of a deep groove type or angular type [each]. Moreover, flat disc-like Rota 7b is fixed to both the above-mentioned ball bearings 10 and the fraction between ten comrades in respect of the pars-intermedia periphery of the above-mentioned nut member 3b. And contiguity opposite of this Rota 7b and the stator 8b prepared in the internal surface of parietal bone of bottom-plate section 9a of housing mainframe 4a which constitutes the above-mentioned motor housing 2a is carried out through the opening between the thrust orientation.

[0021] On the other hand, although each supports radial roads, such as plain bearing and a needle bearing, for the pars-intermedia ends approach fraction of driving-side-ed member 11c in the both ends of the above-mentioned motor housing 2a, it is supporting by the bearing 13 and 13 which does not support thrust loading. Therefore, the above-mentioned driving-side-ed member 11c is supported free [rotation and the displacement covering shaft orientations] inside the above-mentioned motor housing 2a. And a part of circumferencial direction of male screw 12c formed in the one above-mentioned pair of bearing 13 and the fraction between 13 comrades by the pars intermedia of the periphery side of the above-mentioned driving-side-ed member 11c and a part of circumferencial direction of female screw 6b which covered the overall length and was formed in the inner skin of the above-mentioned nut member 3b are meshed mutually.

[0022] Furthermore, output member 15c is combined with the bore side of the above-mentioned driving-side-ed member 11c by the deep groove type which is the bearing which supports thrust loading, or the angular type ball bearings 30 and 30. If the rotation drive of the above-mentioned nut member 3b is carried out in the case of linear motor 1c of this example constituted as mentioned above, since a variation rate will be carried out to shaft orientations, the above-mentioned driving-side-ed member 11c rotating, the variation rate covering these shaft orientations to shoot is taken out by the above-mentioned output member 15c, and the variation rate of the member which engaged with the edge of this output member 15c is carried out.

[0023] Next, drawing 7 shows the 5th example of the gestalt of the operation of this invention corresponding to ** mentioned above. In this example, the fraction in which each was prepared in the periphery side of 11d of shaft-like driving-side-ed members at the circumferencial direction and which formed mutually two or more parallel protruding lines 31 and 31 at equal intervals (in grade pitch), and formed each [these] protruding lines 31 and 31 is used as the engagement slot indicated to the claim. In addition, pitch P of each [these] protruding lines 31 and 31 is made the same as that of pitch P of the female screw 6 formed in the inner skin of the nut member 3.

[0024] If the above-mentioned nut member 3 is rotated, the 11d of the above-mentioned driving-side-ed members will carry out the variation rate also of the case of the above structures of this example to shaft orientations, rotating. Especially, in this example, compared with the case of the 1-4th example in which male screws 12, 12a, 12b, and 12c were formed to the periphery side of the driving-side-ed members 11, 11a, 11b, and 11c, the amount of displacement covering the shaft orientations whose above-mentioned nut member 3 is the 11d of the above-mentioned driving-side-ed members of ** which rotates one time increases. That is, whenever the above-mentioned nut member 3 rotates one time in this example, the 11d of the above-mentioned driving-side-ed members carries out a variation rate to shaft orientations by P- (D0 / d0). Since other configurations and operations are the same as that of either of the 1-4th example which was mentioned above, the illustration and the explanation about an equivalent fraction are omitted.

[0025] In addition, although illustration is omitted While it replaces with two or more protruding lines and a male screw is formed in the periphery side of a driving-side-ed member contrary to the case of the 5th example shown in drawing 7 It can replace with a nut member and the driving-side member to which each formed two or more parallel protruding lines in the inner skin in pitches [male screw / which was formed in the periphery side of a driving-side-ed member / which was formed in the circumferencial direction], and used them as the engagement slot mutually can also be prepared. Moreover, when adopting the structure which forms two or more protruding lines and is used as an engagement slot, a driving-side-ed member is made to incline by theta expressed with theta=tan-1 (P/pi, and D0) to a driving-side member, and the touch area of the engagement